4¾-Digit Multimeter HM8012

Service-Manual



Hersteller Manufacturer Fabricant	HAMEG Instruments GmbH Industriestraße 6 D-63533 Mainhausen	KONFORMITÄTSERKLÄRUNG DECLARATION OF CONFORMITY DECLARATION DE CONFORMITE

Die HAMEG Instruments GmbH bescheinigt die Konformität für das Produkt
The HAMEG Instruments GmbH herewith declares conformity of the product
HAMEG Instruments GmbH déclare la conformite du produit

Bezeichnung / Product name / Designation: Multimeter / Multimeter / Multimètre
Typ / Type / Type: HM8012
mit / with / avec: –
Optionen / Options / Options: –

mit den folgenden Bestimmungen / with applicable regulations / avec les directives suivantes

EMV Richtlinie 89/336/EWG ergänzt durch 91/263/EWG, 92/31/EWG
EMC Directive 89/336/EEC amended by 91/263/EWG, 92/31/EEC
Directive EMC 89/336/CEE amendée par 91/263/EWG, 92/31/CEE

Niederspannungsrichtlinie 73/23/EWG ergänzt durch 93/68/EWG
Low-Voltage Equipment Directive 73/23/EEC amended by 93/68/EEC
Directive des equipements basse tension 73/23/CEE amendée par 93/68/CEE

Angewendete harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées

Sicherheit / Safety / Sécurité
EN 61010-1:2001 (IEC 61010-1:2001)
Überspannungskategorie / Overvoltage category / Catégorie de surtension: II

Verschmutzungsgrad / Degree of pollution / Degré de pollution: 2
Elektromagnetische Verträglichkeit / Electromagnetic compatibility / Compatibilité électromagnétique

EN 61326-1/A1 Störaussendung / Radiation / Emission:
Tabelle / table / tableau 4; Klasse / Class / Classe B.

Störfestigkeit / Immunity / Imunitee: Tabelle / table / tableau A1.

EN 61000-3-2/A14 Oberschwingungsströme / Harmonic current emissions / Émissions de courant harmonique: Klasse / Class / Classe D.

EN 61000-3-3 Spannungsschwankungen u. Flicker / Voltage fluctuations and flicker / Fluctuations de tension et du flicker.

Datum /Date /Date
22.07.2004

Unterschrift / Signature /Signatur

G. Hübenett
Produktmanager

General information regarding the CE marking

HAMEG instruments fulfill the regulations of the EMC directive. The conformity test made by HAMEG is based on the actual generic- and product standards. In cases where different limit values are applicable, HAMEG applies the severer standard. For emission the limits for residential, commercial and light industry are applied. Regarding the immunity (susceptibility) the limits for industrial environment have been used.

The measuring- and data lines of the instrument have much influence on emmission and immunity and therefore on meeting the acceptance limits. For different applications the lines and/or cables used may be different. For measurement operation the following hints and conditions regarding emission and immunity should be observed:

1. Data cables
For the connection between instruments resp. their interfaces and external devices, (computer, printer etc.) sufficiently screened cables must be used. Without a special instruction in the manual for a reduced cable length, the maximum cable length of a dataline must be less than 3 meters and not be used outside buildings. If an interface has several connectors only one connector must have a connection to a cable.
Basically interconnections must have a double screening. For IEEE-bus purposes the double screened cables HZ72S and HZ72L from HAMEG are suitable.

2. Signal cables
Basically test leads for signal interconnection between test point and instrument should be as short as possible. Without instruction in the manual for a shorter length, signal lines must be less than 3 meters and not be used outside buildings.
Signal lines must screened (coaxial cable - RG58/U). A proper ground connection is required. In combination with signal generators double screened cables (RG223/U, RG214/U) must be used.

3. Influence on measuring instruments.
Under the presence of strong high frequency electric or magnetic fields, even with careful setup of the measuring equipment an influence of such signals is unavoidable.
This will not cause damage or put the instrument out of operation. Small deviations of the measuring value (reading) exceeding the instruments specifications may result from such conditions in individual cases.

HAMEG Instruments GmbH

4¾-Digit Programmable Multimeter HM8012



4¾-digit display with 50,000 counts, basic accuracy 0.05 %

Automatic and manual range selection

Max. resolution 10 µV, 0.01 dBm, 10 nA, 10 mΩ, 0.1 °C/°F

Offset function / relative value measurement in basic measurement functions

Input impedance >1 GΩ (0.5 V and 5 V DC range)

RS-232 interface

PC software for control and data logging

Mainframe HM8001-2 required for operation

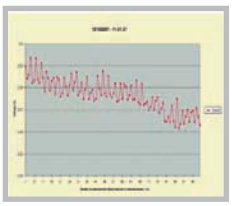
HZ15 (included)



WDM8012 Software (included)



WDM8012 Software (included)



inclusive

RS-232

4¾ -Digit programmable Multimeter HM8012

Valid at 23 °C after a 30 minute warm-up period

DC voltage

Measurement ranges:	500 mV, 5 V, 50 V, 500 V, 600 V
Resolution:	10 µV, 100 µV, 1 mV, 10 mV, 100 mV
Accuracy:	
5 V, 500 V, 600 V:	±(0.05 % of reading +0.002 % of full scale)
500 mV, 50 V:	±(0.05 % of reading + 0.004 % of full scale)
Overload protection:	
V/Ω/T°/dB/⏴ to COM and to chassis:	
	850 V_p at max. 60 Hz or 600 V_{DC}
COM against chassis:	250 V_{rms} at max. 60 Hz or 250 V_{DC}
Input resistance:	
50 V, 500 V, 600 V:	10 MΩ II 90 pF
500 mV, 5 V:	› 1 GΩ II 90 pF
Input current:	10 A
CMRR[1]:	≥ 100 dB (50/60Hz ± 0.5 %)
SMRR[2]:	≥ 60 dB (50/60 Hz ± 0.5 %)

dB Mode

Accuracy:	±(0.02 dB+2 digits) (display › -38.7 dBm)
Resolution:	0.01 dB above 18 % of rating

DC current

Measurement ranges:	500 µA, 5 mA, 50 mA, 500 mA, 10 A
Resolution:	10 nA, 100 nA, 1 µA, 10 µA, 1 mA
Accuracy:	
0.5-500 mA:	±(0.2 % of reading + 0.004 % of full scale)
10 A:	±(0.3 % of reading + 0.004 % of full scale)
Voltage drop:	
10 A range:	0.2 V max.
500 mA range:	2.5 V max.
other ranges:	0.7 V max.

AC voltage

Measurement ranges:	500 mV, 5 V, 50 V, 500 V, 600 V
Resolution:	10 µV, 100 mV, 1 mV, 10 mV, 100 mV
Accuracy 0.5-50 V:	
40 Hz-5 kHz:	± (0.4 % of reading + 0.07 % of full scale)
20 Hz-20 kHz:	± (1 % of reading + 0.07 % of full scale)
Accuracy 500 V and 600 V:	
40 Hz-1 kHz:	± (0.4 % of reading + 0.07 % of full scale)
20 Hz-1 kHz:	± (1 % of reading + 0.07 % of full scale)
Overload protection:	
V/Ω/T°/dB/⏴ to COM and to chassis:	
	850 V_p at max. 60 Hz or 600 V_{DC}
COM against chassis:	250 V_{rms} at max. 60 Hz or 250 V_{DC}
Input impedance	
AC mode:	1 MΩ II 90 pF
AC + DC mode:	10 MΩ II 90 pF
Bandwidth at –3 dB:	80 kHz typical
dB mode:	20 Hz - 20 kHz
Accuracy	
–23.8 dBm to 59.8 dBm:	±0.2 dBm
Resolution:	0.01 dB above 9 mV
CMRR[1]:	≥ 60 dB (50/60 Hz ± 0.5 %)
Crest factor:	7 max.

AC current

Measurement ranges:	500 µA, 5 mA, 50 mA, 500 mA, 10 A
Resolution:	10 nA, 100 nA, 1 µA, 10 µA, 1 mA
Accuracy:	
0.5 - 500 mA:	±(0.7 % of reading + 0.07 % of f.s.)40 Hz - 5 kHz
10 A:	±(1 % of reading + 0.07 % of full scale)

AC + DC measurements

As shown for AC + 25 digits

Resistance

Measurement ranges:	500 Ω, 5 kΩ, 50 kΩ, 500 kΩ, 5 MΩ, 50 MΩ	
Resolution:	10 mΩ, 100 mΩ, 1 Ω, 10 Ω, 100 Ω, 1 kΩ	
Accuracy:		
500 Ω to 500 kΩ:	±(0.05 % of reading + 0.004 % of f.s.+50 mΩ)	
5 MΩ to 50 MΩ:	±(0.3 % of reading + 0.004 % of full scale)	
Input protection max. 300 V_{rms}		
Measurement current:	500 Ω-5 kΩ range:	1 mA
	50 kΩ range:	100 µA
	500 kΩ range:	10 µA
	5-50 MΩ range:	100 nA

Measurement voltage: 10 V typical for open inputs, depending on the value of resistance to be measured. Negative polarity of measurement voltage is across common terminal.

Temperature

2-wire resistance measurement with linearization for PT100 sensors as per standard EN60751

Range:	–200° C to +500° C
Resolution:	0.1° C
Measurement current:	approx. 1 mA
Display:	in ° C, ° F
Accuracy:	± 0.1° C from – 200° C to + 200° C
	± 0.2° C from 200° C to 500° C
	(exception: sensor tolerance)

Temperature coefficient: (reference 23°C)

V =	500 mV, 50 V	30 ppm/° C
	600 V range	80 ppm/° C
	other ranges	20 ppm/° C
V ~	600 V range	80 ppm/° C
	other ranges	50 ppm/° C
mA	all ranges	200 ppm/° C
mA~	all ranges	300 ppm/° C
Ω	5 MΩ, 50 MΩ ranges	200 ppm/° C
	other ranges	50 ppm/° C

Miscellaneous

Power supply (from mainframe):	
+ 5 V	300 mA
~26 V	140 mA
Operating temperature:	+ 10° C to + 40° C
Max. relative humidity:	80 % (without condensation)
Dimensions (W x H x D) (without 22-pole flat plug):	
	135 x 68 x 228 mm
Weight:	approx. 0.5 kg

[1] Common mode rejection ratio [2] Serial mode rejection ratio

Accessories supplied: Operator's Manual, HZ15 PVC test leads, HM8012: + Software CD and interface cable
Optional accessories: HZ10 Silicone test leads, HZ812 PT100 Temperature Sensor

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Control Elements

① **DISPLAY** (7-segment LED + LED)
The digital display shows the measurement value with 4¾ digit resolution, in which the largest figure is used up to "5". It will also display various warning messages. The measurement value will be displayed with decimal points and polarity sign. For DC measurement, a minus sign will appear in front of the figures when the positive polarity of the measured value is connected to the COM input ⑦.

② **🔈 (LED)**
Indicator denoting validation of the audible continuity test signal. When used as an ohmmeter, the audible signal triggers when the measured resistance value is less than 0.1% of the range or 50 counts. For other functions, the indicator is hidden.

③ **🔈 BEEP** (pushbutton)
Pushbutton for activating the audible signal.

④ **A** (safety terminal for 4 mm banana plugs)
Connection (high potential) for DC and AC current measurements in the 10 A range in conjunction with the COM input ⑦ (low potential).

Current in excess of 10 A (max. 20 A) must not be applied for a period exceeding 30 s, otherwise the internal measurement resistor thermal device will blow.

⑤ **mA** (safety terminal for 4 mm banana plugs)
Connection (high potential) for DC and AC current measurements up to 500 mA in conjunction with COM input ⑦ (low potential). The input is fuse-protected.

⑥ **HOLD** (LED)
Indicator denoting that the displayed value has been frozen. The function can be activated using key ⑩. Deactivation is by pressing the HOLD/OFFSET key.

⑦ **COM** (safety terminal for 4 mm bana plugs)
The COM terminal (low potential) is the common connector for all the measurement functions to which the potential close to the ground of the measured quantity will be applied.

For safety reasons, the voltage across this terminal compared to the case (guard wire, ground) shall be 250 V at most.

⑧ **OFFSET** (LED)
Indicator denoting that the displayed value is a relative measurement. The displayed value corresponds to the input value less the value present on the display during initial action on the HOLD/OFFSET key ⑩. Activate this function by means of a second press on the HOLD/OFFSET key.

⑨ **V/Ω/T°/dB/ ⏩**
(safety terminal for 4 mm banana plugs)
Connection (high potential) for measurements of voltages, resistances, temperatures and diode junctions in conjunction with the COM input ⑦ (safety terminal).

For safety reasons, the voltage across this terminal compared to the case (guard wire, ground) shall be 600 V_{DC} at most.

⑩ **HOLD/OFFSET** (pushbutton)
Pushbutton for validating the HOLD or OFFSET functions. Pressing the key the first time will freeze the front panel display. The HOLD indicator ⑥ then lights up. The AUTO, AC-DC, BEEP, ◀ ⑪ and ▶ ⑫ keys are inoperative.
A second press gives access to the relative mode. The value memorized by the HOLD function is then subtracted from each measurement before being displayed. The OFFSET indicator ⑧ lights up.
A third press will freeze the relative value. The HOLD ⑥ and OFFSET ⑧ indicators light up. A fourth press will delete the HOLD and OFFSET mode.

⑪ ◀ (pushbutton)
Pushbutton for changing to a lower range. On each press, the new range is displayed fleetingly on the display in code form (L1 for lowest range, L2 for second range, etc.).

⑫ ▶ (pushbutton)
Pushbutton for changing to a higher range. Each time pressed, the new range will be displayed fleetingly on the display in code form (L1 for lowest range, L2 for second range, etc.).

⑬ **RS-232** (DB9)
Female DB9 connector intended for serial communication.

⑭ **AUTO (LED)**
Indicator signalling that the multimeter is in AUTOMATIC mode. In this mode, action on keys ◀ ⑪ and ▶ ⑫ is inoperative.

⑮ **AUTO** (pushbutton)
Pushbutton for switching the AUTO range selection to the MANUAL range selection and vice versa.
In MANUAL mode, the choice of range is left to user initiative using the keys ◀ ⑪ and ▶ ⑫.

⑯ **Unit display zone** (LED)
This zone contains a display of the measurement units. It also identifies the function selected by pressing the ▼ ⑱ or ▲ ⑲ key.

⑰ **AC-DC** (pushbutton)
This key is used for selecting the measurement mode (DC, rms AC or rms AC + DC).
Indicators below indicate the measurement mode:
DC: measurement of DC voltages
AC: measurement of RMS AC voltages
DC + AC: measurement of RMS AC+DC voltages.

⑱ ▼ (pushbutton)
Pushbutton for selecting the next function.

⑲ ▲ (pushbutton)
Pushbutton for selecting the previous function. On startup, the unit switches automatically to the DC voltmeter, MANUAL mode function and 600 voltrange.

Function Test

This test should help to verify, at certain intervals, the functions of HM8012 without any great expenditure in measurement instruments. To achieve thermal balance, the module and the basic instrument, in its case, must be energized for at least 60 minutes before the test begins.

Measurement equipment used

Calibrator AC/DC for instance Fluke 5101B / Fluke 5700A / Rotek 600
Resistors of 5 kΩ, 50 kΩ, 500 kΩ 0.01% for instance model S102 J by Vishay
Resistors 500 kΩ, 5 MΩ 0.02%, for instance models CNS020 by Vishay.

Test procedure

If one of the indicated calibrators is available or if precision calibrators are appropriate, all the HM8012 measurements ranges can be checked using the following tables which indicate the limit values. Recalibration, however, should only be performed if the appropriate precision calibrator is available.

Before any change of ranges, ensure that the signal at HM8012 does not represent an unacceptable load of the object under examination. For the link between the calibrator and HM8012, shielded cables must be used to prevent any unwanted influence caused by the measurement signal.

a) DC voltage ranges

No.	Range	Reference (+23 °C)	Display limits
1	500 mV	250 mV	249.85 - 250.15
2	5 V	2.5 V	2.4986 - 2.5014
3	50 V	25. V	24.985 - 25.015
4	500 V	250 V	249.86 - 250.14
5	600 V	550.00 V	549.7 - 550.3

b) AC voltage ranges

No.	Range	Reference (+23 °C)	Display limits
1	500 mV	250 mV	(1) 248.65 - 251.35 (2) 247.15 - 252.85
2	5 V	2.5 V	(1) 2.4865 - 2.5135 (2) 2,4715 - 2.5285
3	50 V	25 V	(1) 24.865 - 25.135 (2) 24.715 - 25.285
4	500 V	250 V	(3) 248.65 - 251.35 (4) 247.15 - 252.85
5	600 V	550 V	(3) 547.3 - 552.6 (4) 544.0 - 555.9

(1) = 40 Hz to 5 kHz
(2) = 20 Hz to 20 kHz
(3) = 40 Hz to 1 kHz
(4) = 20 Hz to 1 kHz.

c) DC current ranges

No.	Range	Reference (+23 °C)	Display limits
1	500 µA	250.00 µA	249.48 - 250.52
2	5 mA	2.5000 mA	2.4948 - 2.5052
3	50 mA	25.000 mA	24.948 - 25.052
4	500 mA	250.00 mA	249.48 - 250.52
5	10 A	1.800 A	1.794 - 1.806

d) AC current ranges (f = 400 Hz)

No.	Range	Reference (+23 °C)	Display limits
1	500 µA	250.00 µA	247.9 - 252.1
2	5 mA	2.5000 mA	2.479 - 2.521
3	50 mA	25.000 mA	24.79 - 25.21
4	500 mA	250.00 mA	247.9 - 252.1
5	10 A	1.800 A	1.775 - 1.825

e) Resistor ranges

No.	Range	Reference (+23 °C)	Display limits
1	500 Ω	200.00 Ω	199.83 - 200.17
2	5 kΩ	2.0000 kΩ	1.9989 - 2.0011
3	50 kΩ	20.000 kΩ	19.989 - 20.011
4	500 kΩ	200.00 kΩ	199.89 - 200.11
5	5 MΩ	2.0000 MΩ	1.9939 - 2.0061
6	50 MΩ	20.000 MΩ	19.393 - 20.061

Calibration

Calibration of the HM8012 digital multimeter is performed mainly by software. In order to enter the calibration menu keep both pushbuttons AUTO ⑮ and BEEP ③ depressed until the message CAL is displayed. After the release of both pushbuttons the first calibration step will be indicated. First the unit will be shown then the value of the calibration voltage etc. which has to be applied to the instrument. In this mode the following pushbuttons will function as given:

Pushbutton	Action
AUTO ⑮	Corrected value of the range selected if the LED ② is on, otherwise the input of the preceding step will be displayed.
BEEP ③	Displays not yet calibrated values. The LED ② will be on, the value can be changed by pushbutton ⑮.
▶ ⑫	Change to the following calibration step.
◀ ⑪	Change to the preceding calibration step.
AC+DC ⑰	Saving the calibrated values.

Calibration procedure

1. Apply the calibration value specified.
2. Press BEEP ③. The former not yet corrected value will be displayed. The LED ② will be on.
3. Press AUTO ⑮ to perform the calibration, the corrected value should be displayed.
4. Press ▶⑫ in order to proceed. (Pressing ▶⑫ will display the actual calibration information without moving to another step.)

Please note:
In order to guarantee a fully calibrated instrument be sure to perform a complete calibration cycle.

Hints:

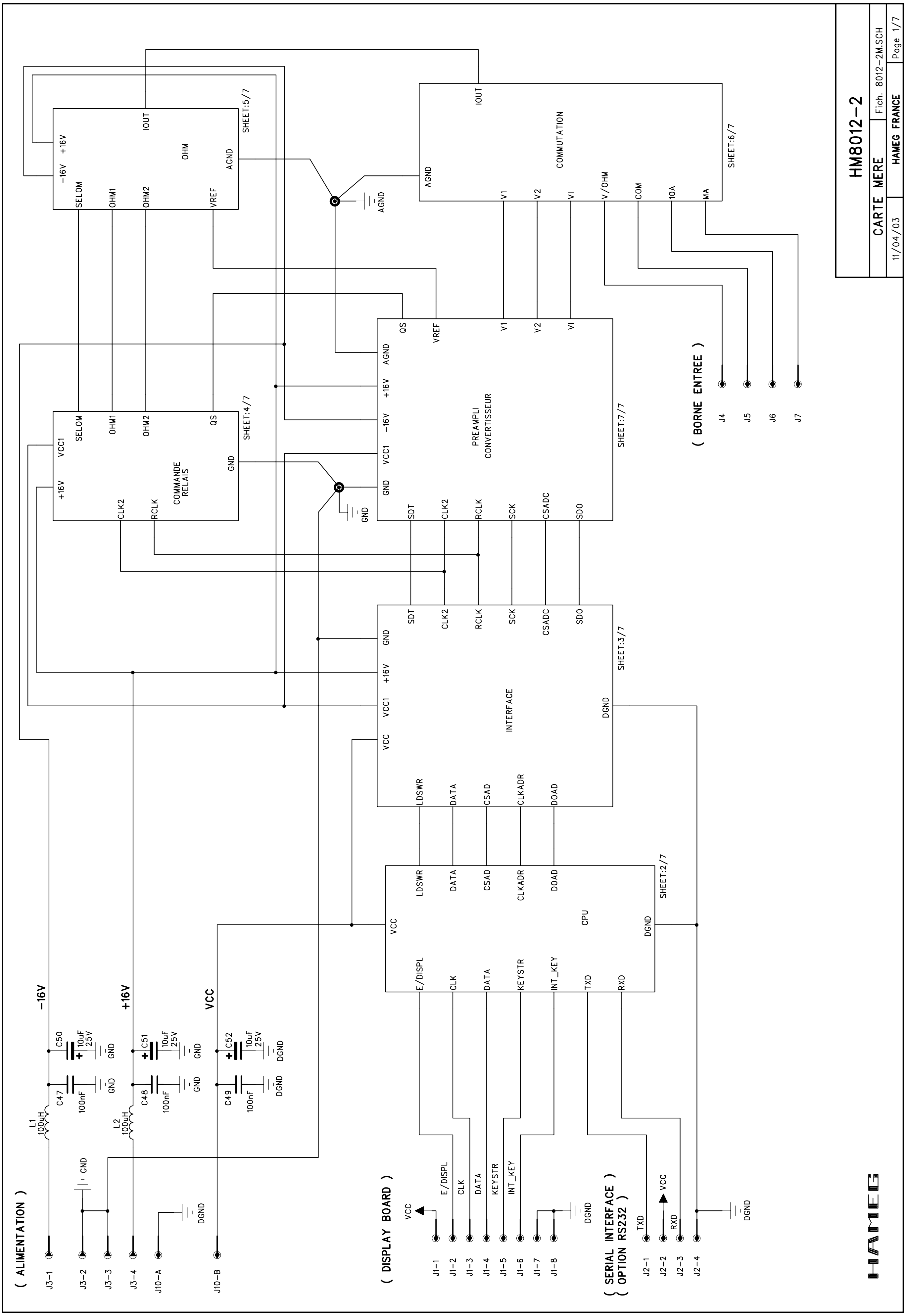
– Pressing the AUTO ⑮ pushbutton without the BEEP ③ pushbutton will display the value resulting from the preceding calibration; in case it is correct no calibration will be necessary. Pressing AUTO ⑮ again will return the instrument to the menu. Pressing either ◀ or ▶ the next or the last calibration step will be accessed.
– For precise resistance calibration it is necessary to connect the calibration resistors as closely to the input terminals as possible.
– Pressing the AC/DC ⑰ pushbutton will store the calibrated values.

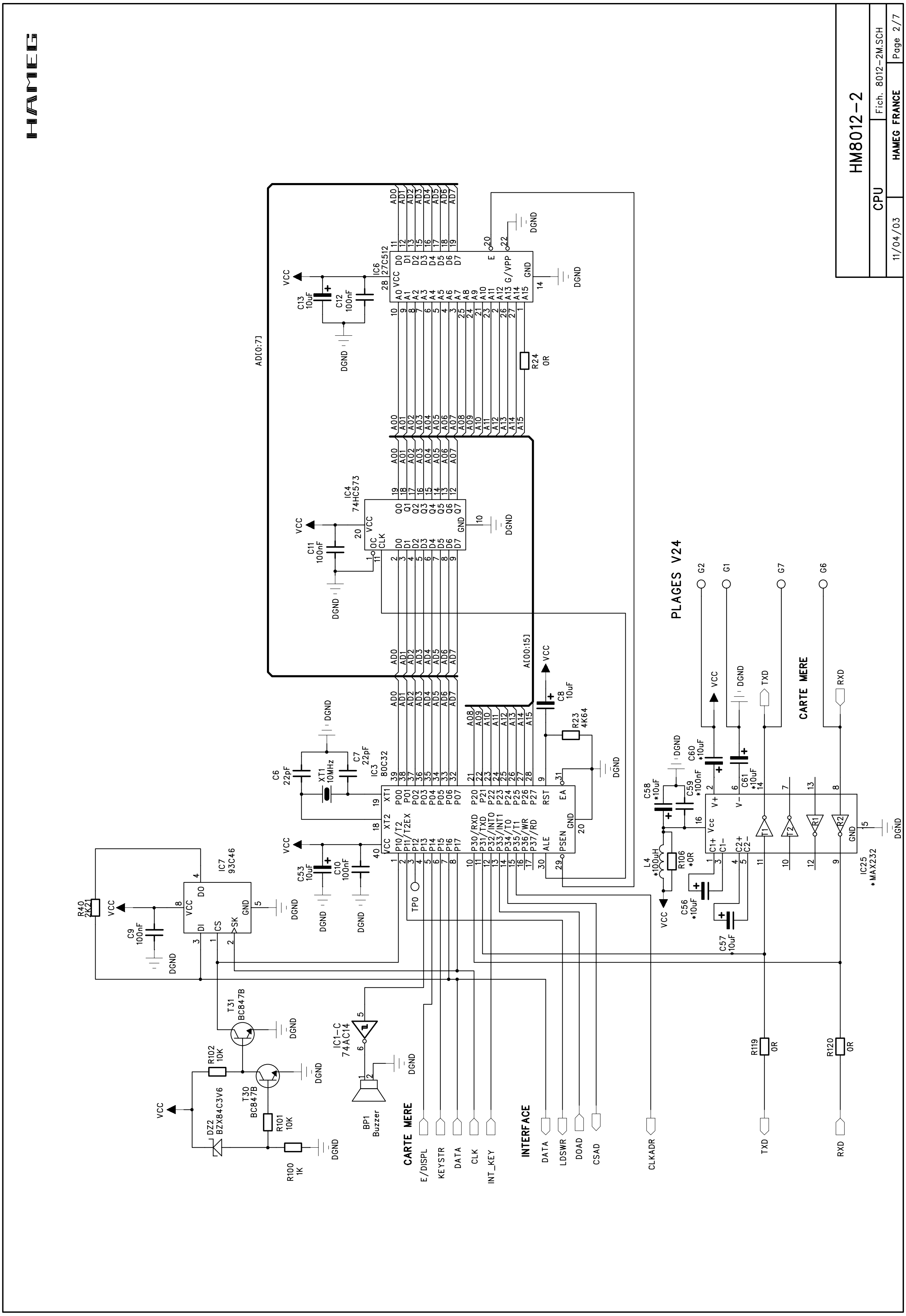
Calibration of frequency compensation
While observing the necessary safety precautions open the instrument. Select the 50 V AC range. Apply 25 V AC 15 kHz. Adjust the capacitor CV1 until the display reads 25,000 ±5 digits.

Listing of calibration steps

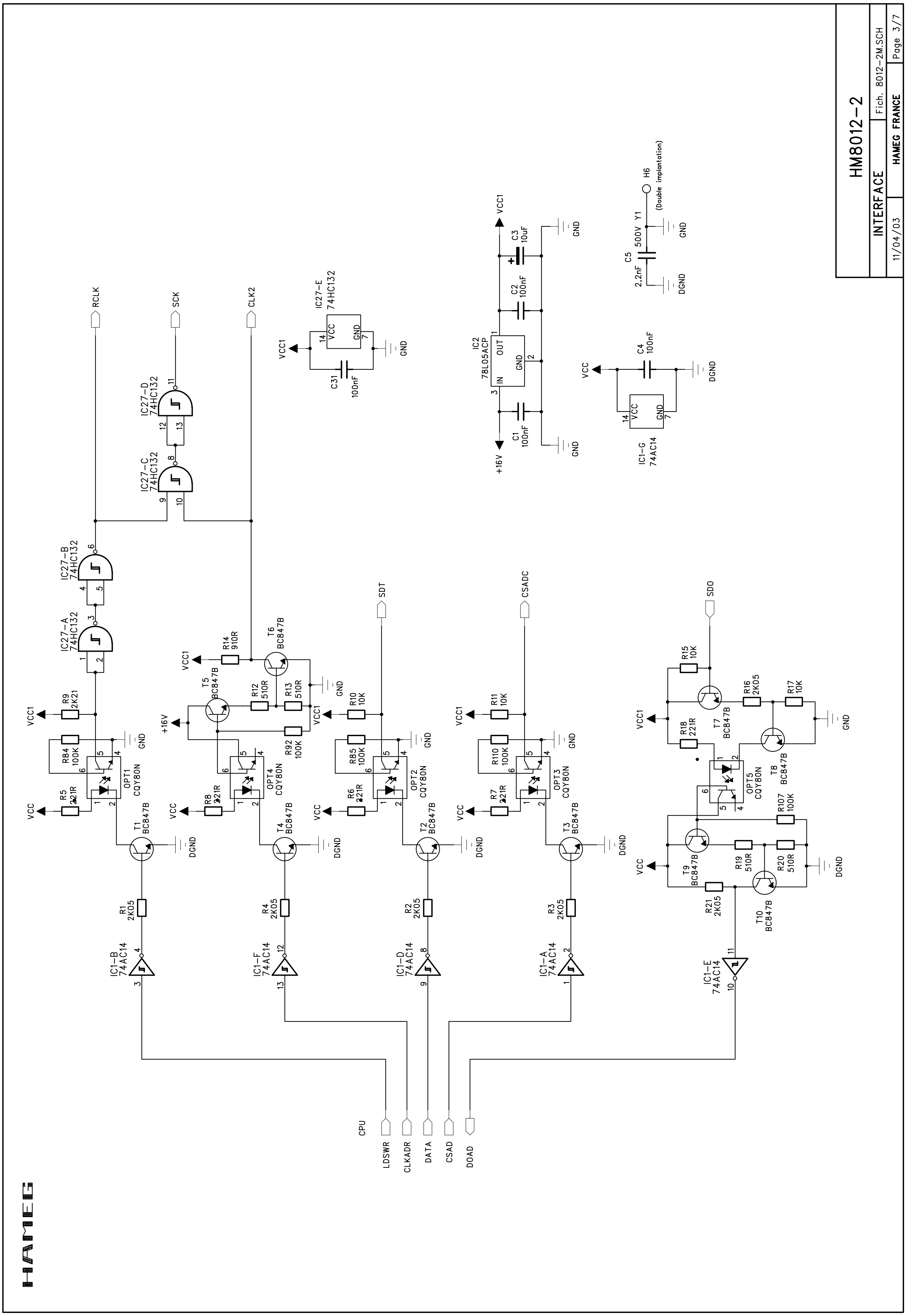
Step	Indication	Input
1	U 0.5 V	500,00 mV
2	U 5 V	5,0000 V
3	U -5 V	-5,0000 V
4	U 500 V	500,0 V
5	U 1E3 V	1000,0 V
6	U- 1E3 V	-1000,0 V
7(*)	u0 0.0 V	0V (short-circuit)
8(*)	u1 0.0 V	0V (short-circuit)
9(*)	u 0.25 V	0,25Veff/500Hz
10	o 5 kΩ	5 kΩ
11	o 50 kΩ	50 kΩ
12	o 500 kΩ	500 kΩ
13	o 5 MΩ	5 MΩ
14	o oFS Ω	0 Ω (with cords)

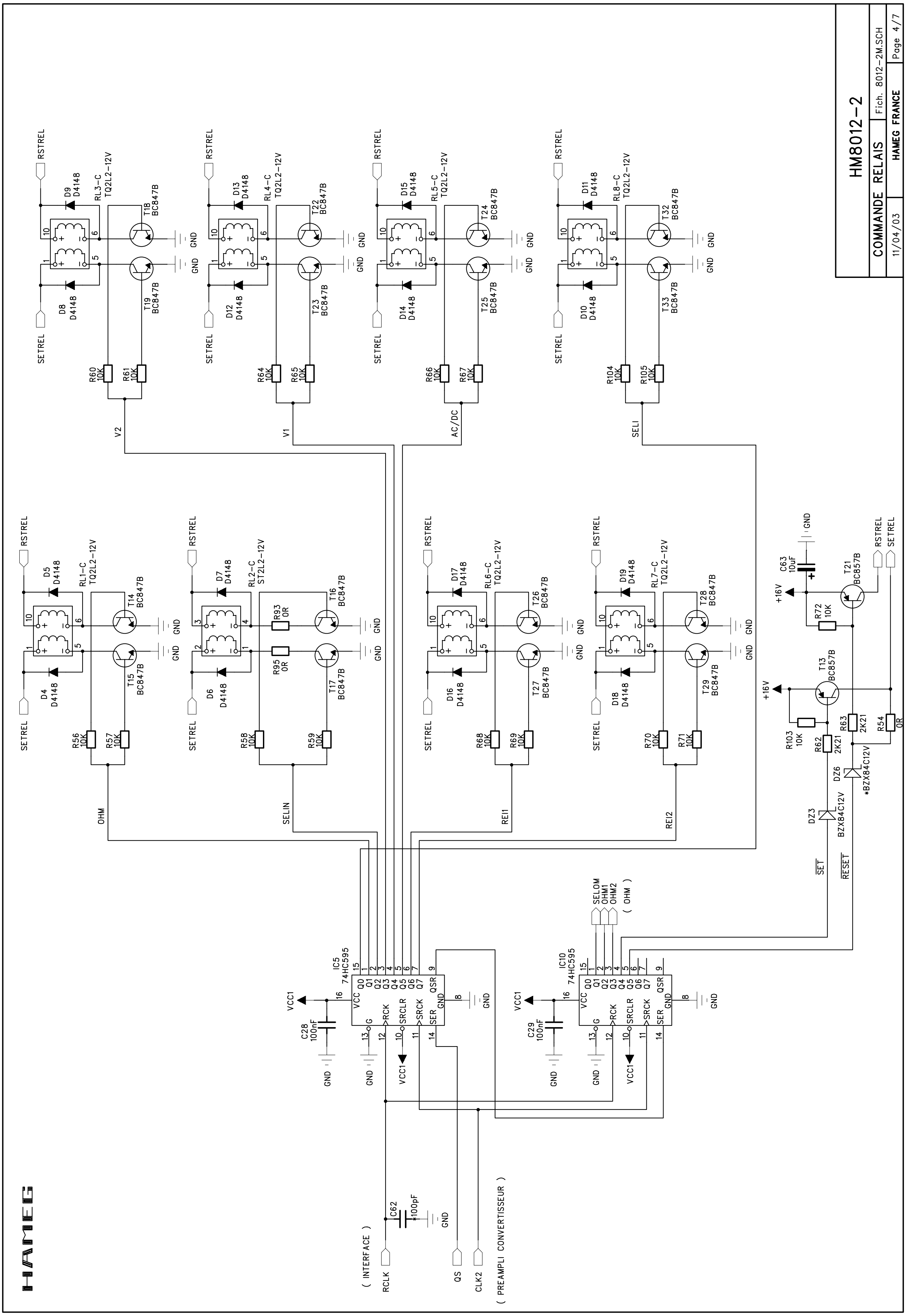
(*) Wait for complete stabilization of the display.

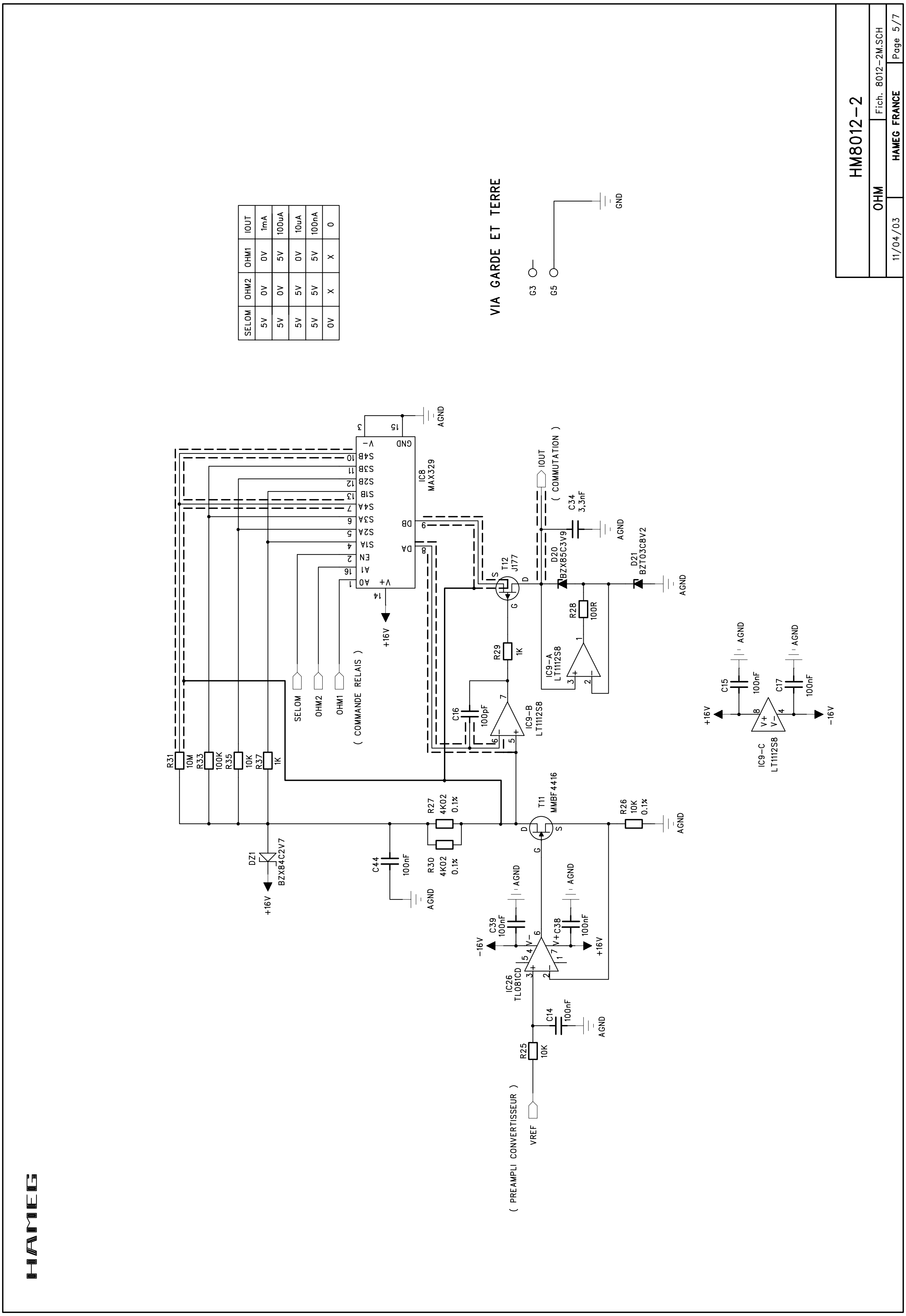

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OHM
SHEET:5/7
-16V
+16V
IOUT
SELOM
OHM1
OHM2
VREF
AGND
COMMUTATION
SHEET:6/7
V1
V2
VI
V/OHM
COM
10A
MA
COMMANDE RELAIS
SHEET:4/7
VCC1
QS
GND
CLK2
RCLK
PREAMPLI CONVERTISSEUR
SHEET:7/7
SDT
SCK
CSADC
SDO
INTERFACE
SHEET:3/7
VCC
DGND
LDSWR
DATA
CSAD
CLKADR
DOAD
CPU
SHEET:2/7
E/DISPL
CLK
KEYSTR
INT_KEY
TXD
RXD
(BORNE ENTREE)
J4
J5
J6
J7
(ALIMENTATION)
J3-1
J3-2
J3-3
J3-4
J10-A
J10-B
L1 100uH
L2 100uH
C47 100nF
C48 100nF
C49 100nF
C50 10uF 25V
C51 10uF 25V
C52 10uF 25V
(DISPLAY BOARD)
J1-1
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
(SERIAL INTERFACE)
(OPTION RS232)
J2-1
J2-2
J2-3
J2-4
HAMEG

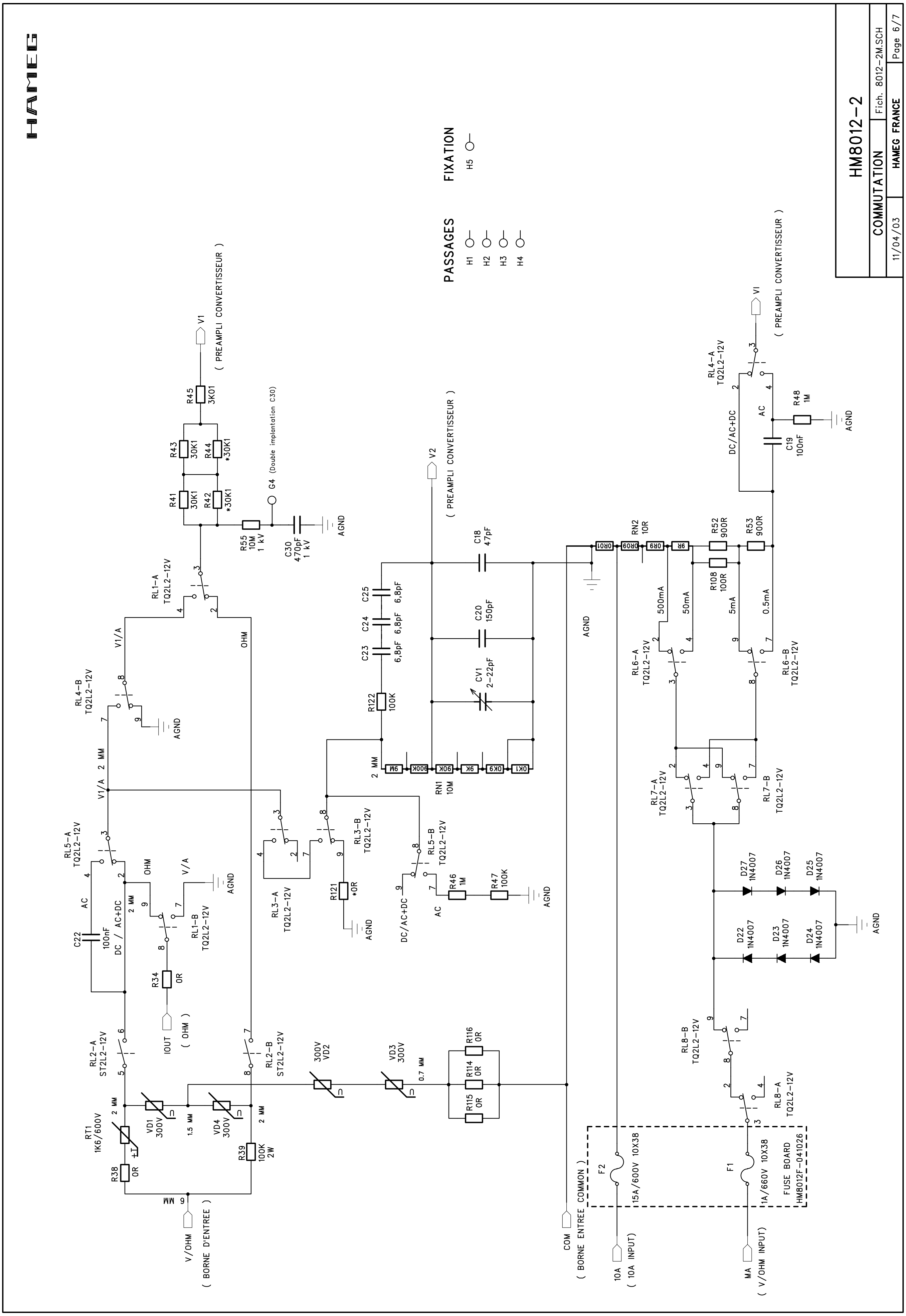


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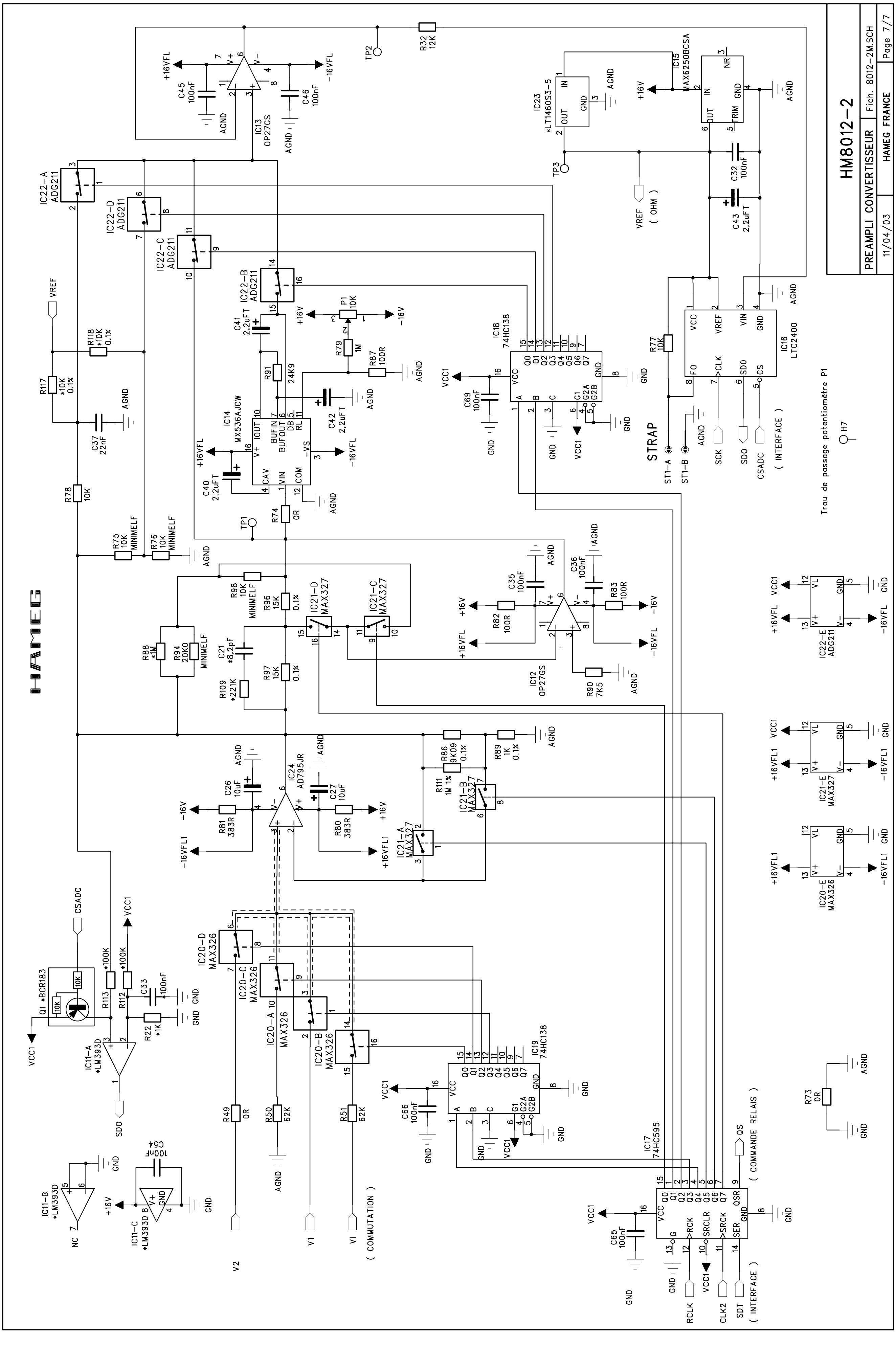

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INTERFACE
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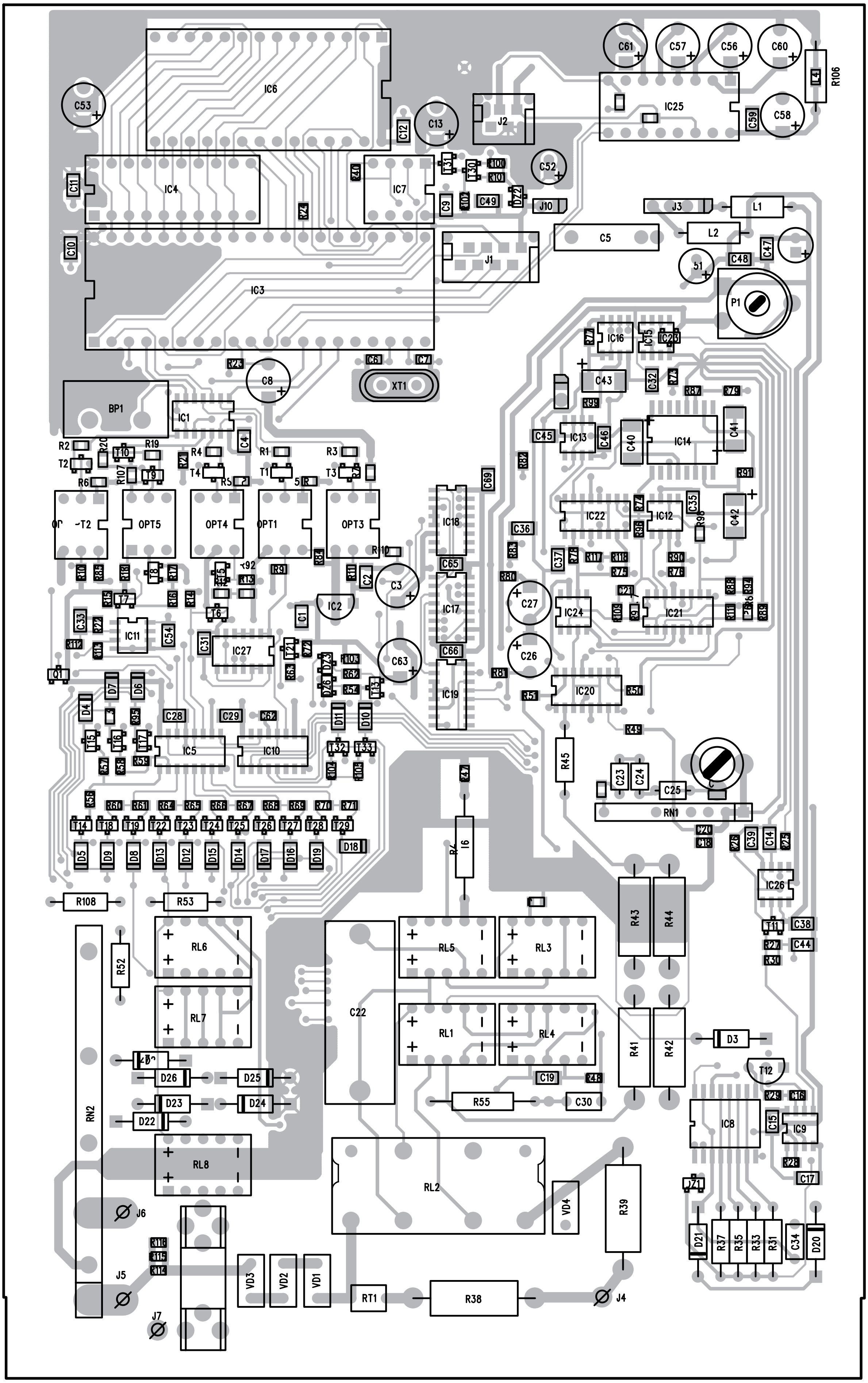

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COMMANDE RELAIS
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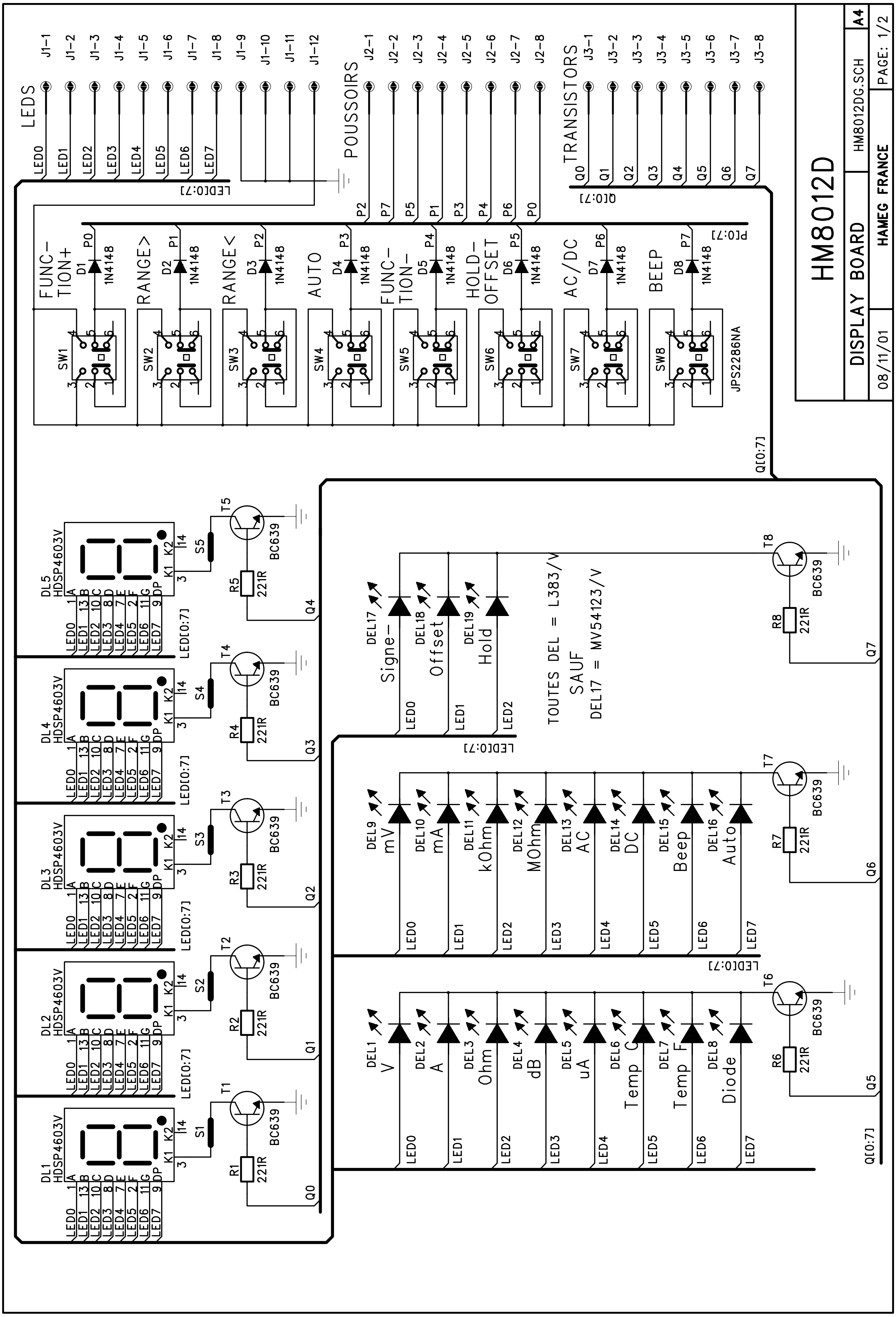

HM8012-2
OHM
11/04/03
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VIA GARDE ET TERRE
G3
G5
GND
SELOM OHM2 OHM1 IOUT
5V 0V 0V 1mA
5V 0V 5V 100uA
5V 5V 0V 10uA
5V 5V 5V 100nA
0V X X 0
IC8
MAX329
AGND
+16V
IOUT
(COMMUTATION)
C34
3,3nF
D20
BZX85C3V9
D21
BZT03C8V2
T12
J177
R28
100R
IC9-A
LT1112S8
R29
1K
C16
100pF
IC9-B
LT1112S8
SELOM
OHM2
OHM1
(COMMANDE RELAIS)
C15
100nF
C17
100nF
IC9-C
LT1112S8
-16V
R31
10M
R33
100K
R35
10K
R37
1K
DZ1
BZX84C2V7
C44
100nF
R27
4K02
0.1%
R30
4K02
0.1%
T11
MMBF4416
R26
10K
0.1%
C39
100nF
C38
100nF
IC26
TL081CD
C14
100nF
R25
10K
VREF
(PREAMPLI CONVERTISSEUR)
HAMEG

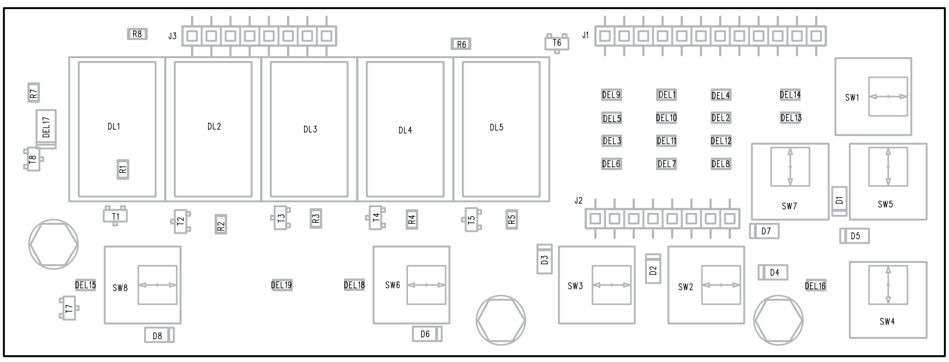


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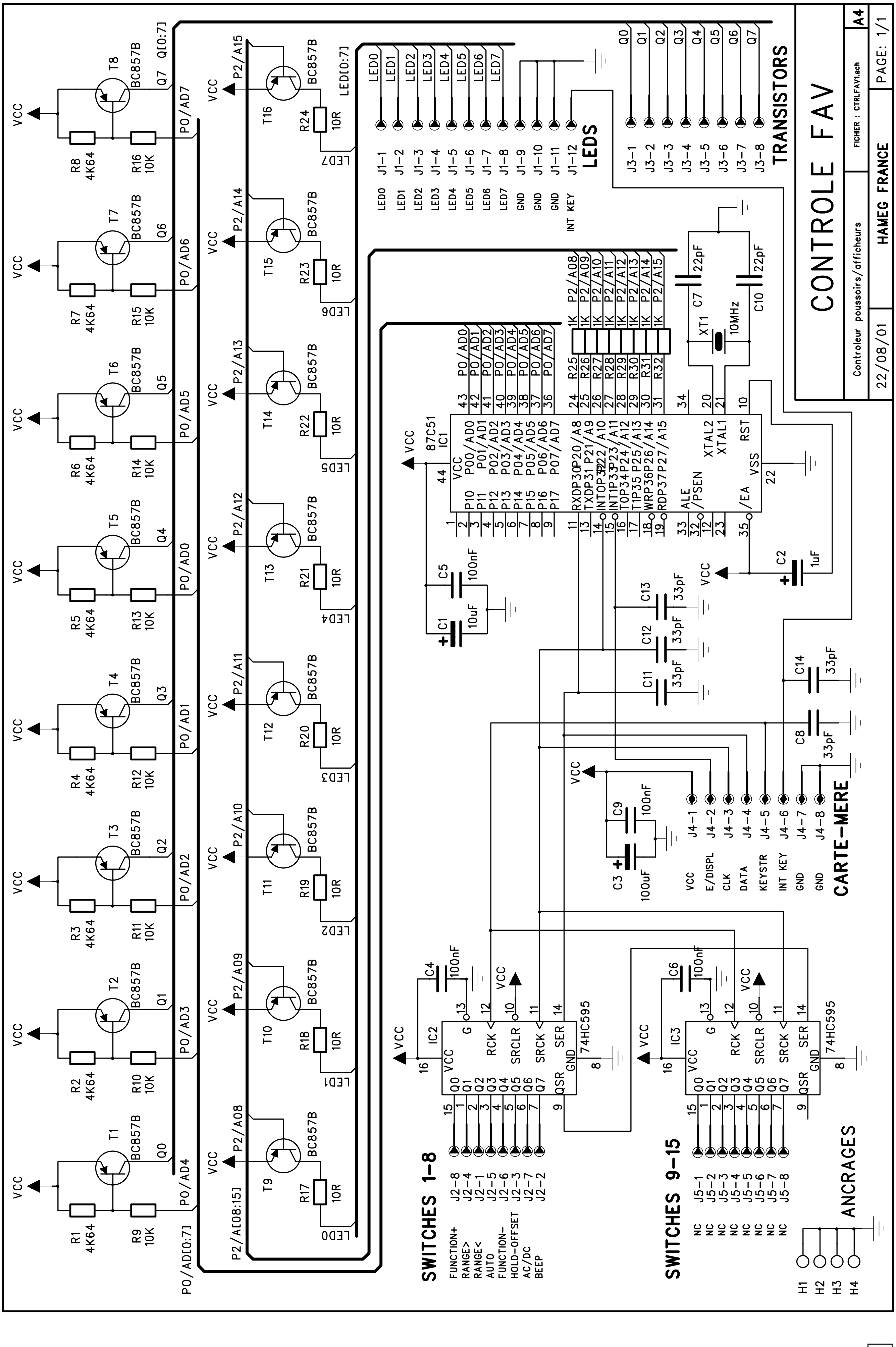

HM8012-2
PREAMPLI CONVERTISSEUR
Fich. 8012-2M.SCH
Page 7/7
11/04/03
HAMEG FRANCE
HAMEG
STRAP
Trou de passage potentiomètre P1
(INTERFACE)
(COMMANDE RELAIS)
(COMMUTATION)
(OHM)

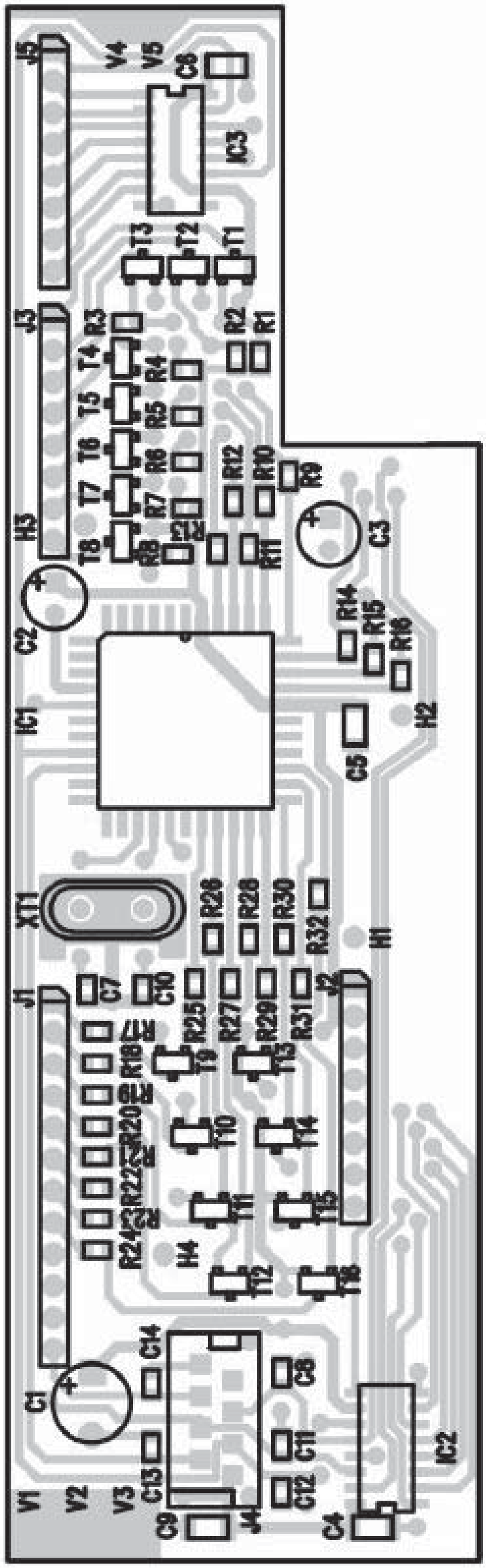


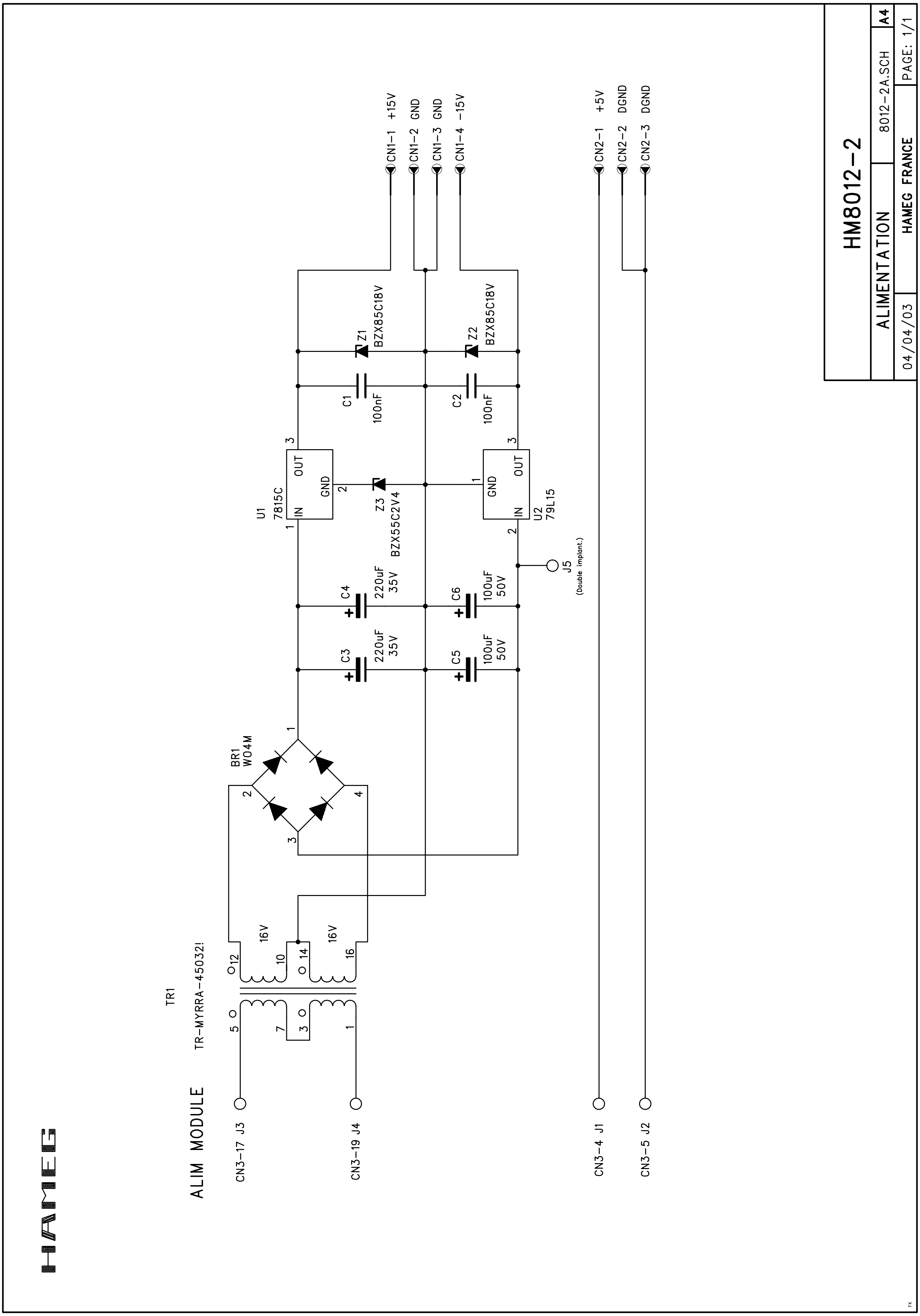

HM8012D
DISPLAY BOARD
HM8012DG.SCH
HAMEG FRANCE
08/11/01
PAGE: 1/2
A4
LEDS
POUSSOIRS
TRANSISTORS
FUNC-TION+
RANGE>
RANGE<
AUTO
FUNC-TION-
HOLD-OFFSET
AC/DC
BEEP
JPS2286NA
TOUTES DEL = L383/V
SAUF
DEL17 = MV54123/V
Signe-
Offset
Hold
mV
mA
kOhm
MOhm
AC
DC
Beep
Auto
V
A
Ohm
dB
uA
Temp C
Temp F
Diode
HDSP4603V
BC639
221R
1N4148

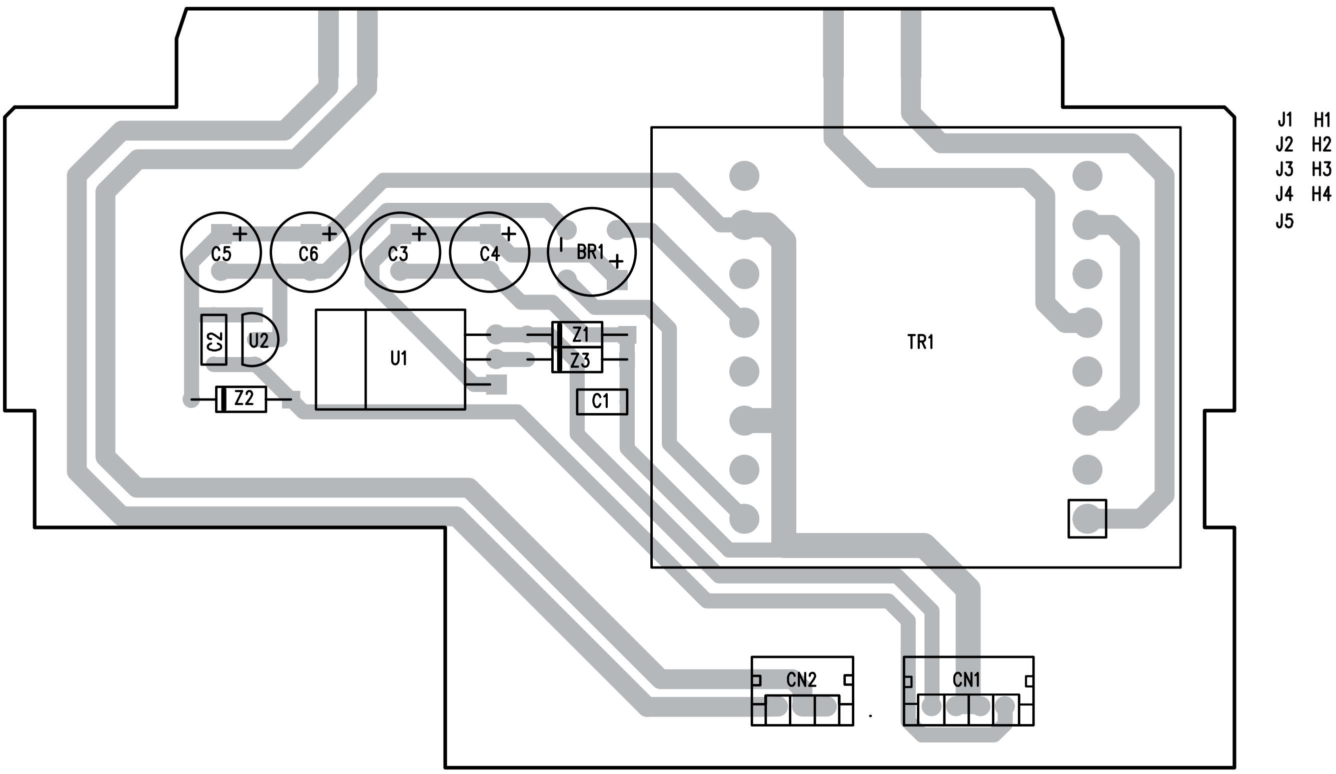


HM8012D–041027.pcb

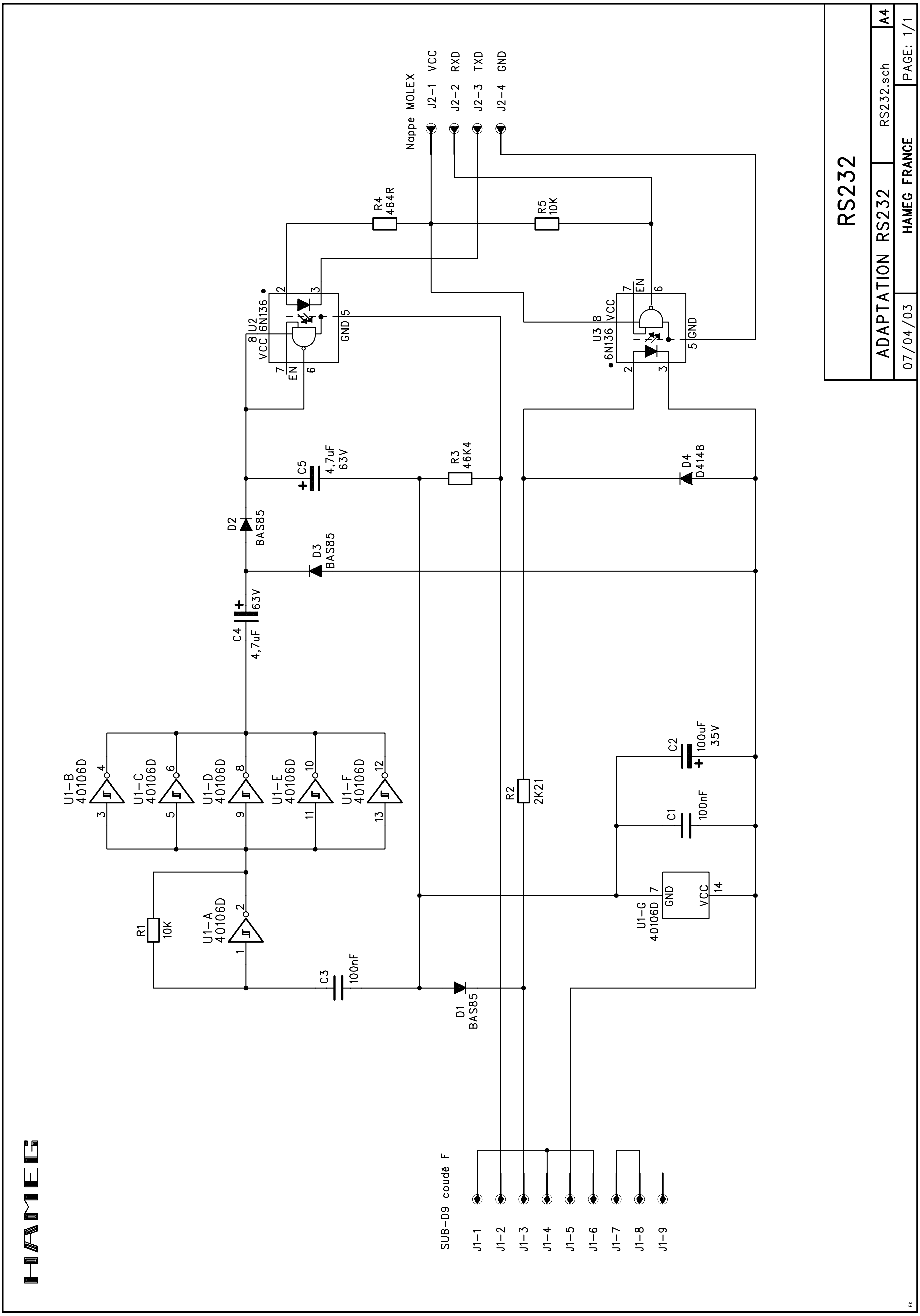

CONTROLE FAV
Controleur poussoirs/afficheurs
FICHIER : CTRLFAV1.sch
HAMEG FRANCE
22/08/01
A4
PAGE: 1/1
TRANSISTORS
LEDS
CARTE-MERE
SWITCHES 1-8
SWITCHES 9-15
ANCRAGES
87C51
IC1
74HC595
IC2
IC3
XT1
10MHz
FUNCTION+
RANGE>
RANGE<
AUTO
FUNCTION-
HOLD-OFFSET
AC/DC
BEEP
VCC
E/DISPL
CLK
DATA
KEYSTR
INT KEY
GND


J5
V4
V5
C6
IC3
T3
T2
T1
J3
R3
T4
R4
R2
R1
T5
R5
T6
R6
R12
R10
R9
T7
R7
H3
T8
R11
C3
C2
R14
R15
R16
IC1
H2
C5
XT1
R26
R28
R30
R32
H1
J1
C7
C10
R25
R27
R29
R31
J2
T9
T13
T10
T14
T11
T15
H4
T12
T16
C14
C1
C8
C11
IC2
C13
C12
V1
V2
V3
C9
J4
C4

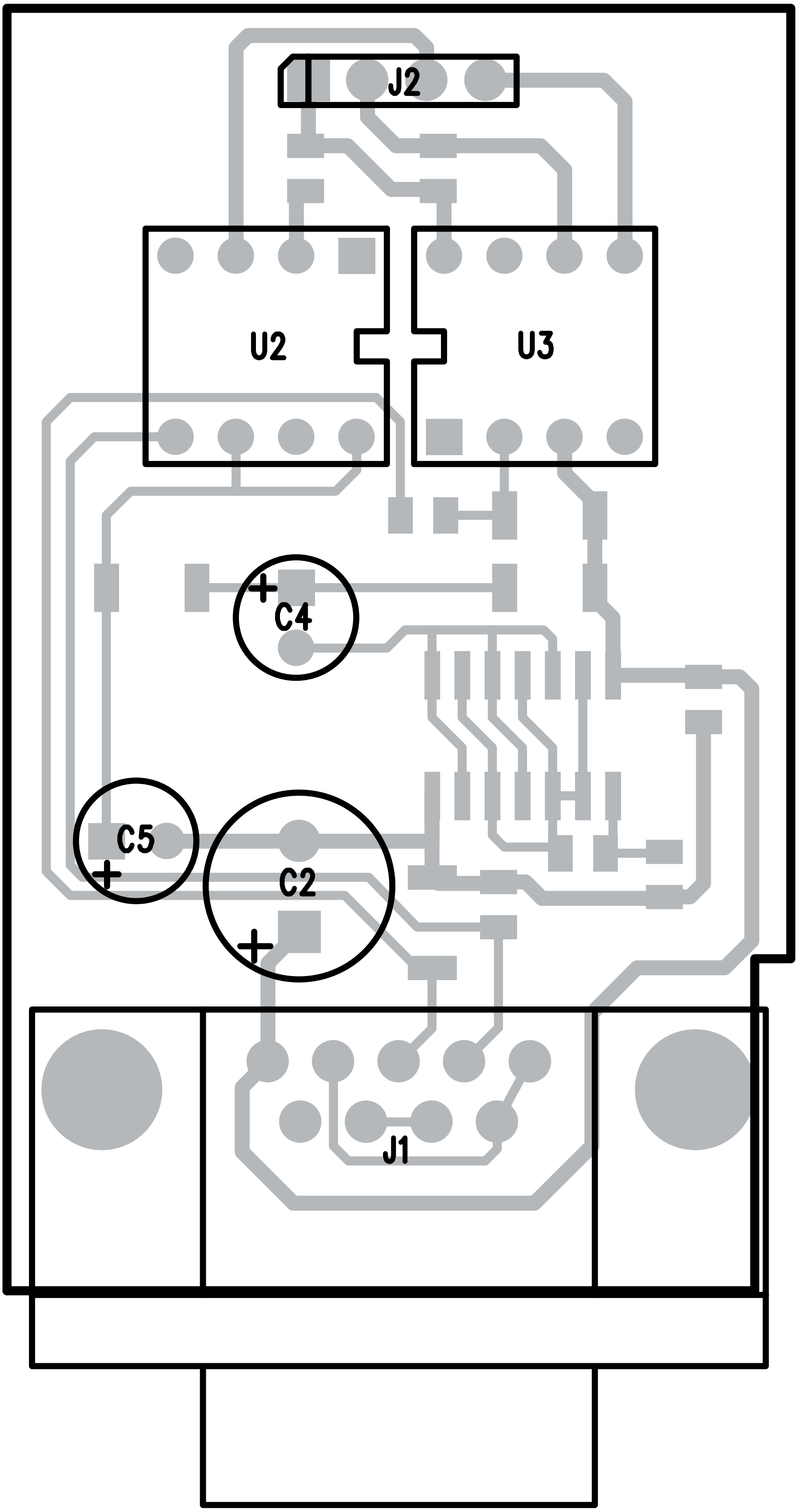

HAMEG
ALIM MODULE
TR1
TR-MYRRA-45032!
CN3-17 J3
CN3-19 J4
CN3-4 J1
CN3-5 J2
16V
16V
BR1
W04M
U1
7815C
IN
OUT
GND
U2
79L15
Z1
BZX85C18V
Z2
BZX85C18V
Z3
BZX55C2V4
C1
100nF
C2
100nF
C3
220uF
35V
C4
220uF
35V
C5
100uF
50V
C6
100uF
50V
J5
(Double implant.)
CN1-1 +15V
CN1-2 GND
CN1-3 GND
CN1-4 -15V
CN2-1 +5V
CN2-2 DGND
CN2-3 DGND
HM8012-2
ALIMENTATION
8012-2A.SCH
A4
04/04/03
HAMEG FRANCE
PAGE: 1/1


C5
C6
C3
C4
BR1
C2
U2
U1
Z1
Z3
Z2
C1
TR1
CN2
CN1
J1 H1
J2 H2
J3 H3
J4 H4
J5

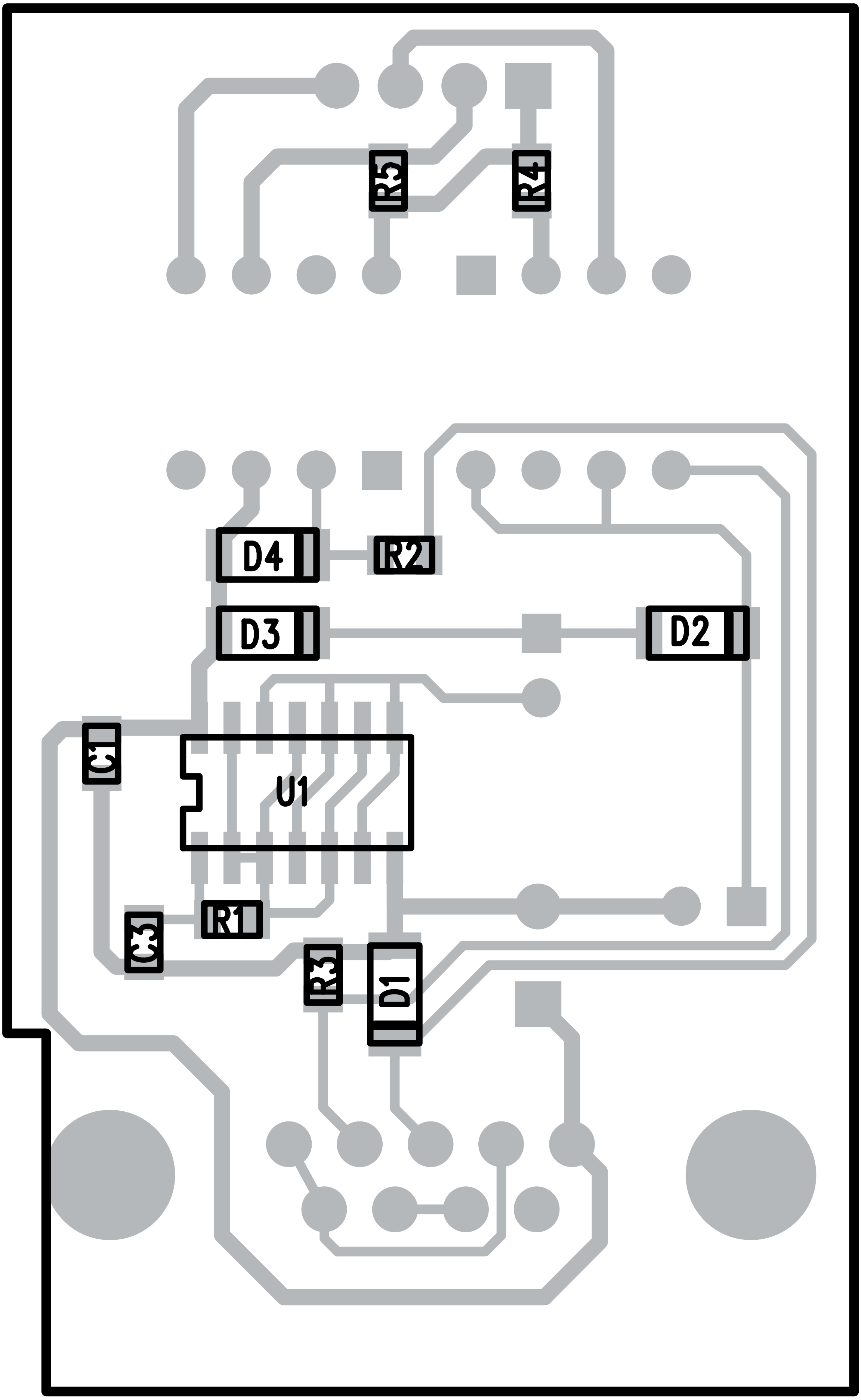
8012-2a.pcb


RS232
ADAPTATION RS232
RS232.sch
A4
07/04/03
HAMEG FRANCE
PAGE: 1/1
Nappe MOLEX
J2-1 VCC
J2-2 RXD
J2-3 TXD
J2-4 GND
R4 464R
R5 10K
U2 6N136
U3 6N136
VCC
GND
EN
C5 4,7uF 63V
R3 46K4
D4 D4148
D2 BAS85
D3 BAS85
C4 4,7uF 63V
U1-B 40106D
U1-C 40106D
U1-D 40106D
U1-E 40106D
U1-F 40106D
R2 2K21
C2 100uF 35V
C1 100nF
U1-G 40106D
R1 10K
U1-A 40106D
C3 100nF
D1 BAS85
SUB-D9 coudé F
J1-1
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9
HAMEG

H1



Rs232.pcb



Rs232.pcb

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